



SEQUENCE LISTING

<110> Bron, Sierd
Jongbloed, Jan D.H.
Mueller, Joerg P.
Van Dijl, Jan M.

<120> Twin-Arginine Translocation in Bacillus

<130> GC634-2

<140> US 09/954,737

<141> 2001-09-17

<150> US 60/233,610

<151> 2000-09-18

<160> 83

<170> FastSEQ for Windows Version 4.0

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<211> 89

<212> PRT

<213> Escherichia coli

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Gly	Ala	Ser	Ile	Lys	Gly	Phe	Lys	Lys	Ala	Met	Ser	Asp	Asp	Glu	Pro
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Ala	Asp	Lys	Gln	Ala	Asp	Thr	Asn	Gln	Glu	Gln	Ala	Lys	Thr	Glu	Asp
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<211> 67

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<213> Escherichia coli

<400> 2

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Val	Leu	Leu	Phe	Gly	Thr	Lys	Lys	Leu	Arg	Thr	Leu	Gly	Gly	Asp	Leu
			20					25					30		
Gly	Ala	Ala	Ile	Lys	Gly	Phe	Lys	Lys	Ala	Met	Asn	Asp	Asp	Asp	Ala
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His Lys Glu
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<210> 3
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<213> *Bacillus subtilis*

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Ile Ile Phe Gly Pro Lys Lys Leu Pro Glu Leu Gly Lys Ala Ala Gly
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Asp Thr Leu Arg Glu Phe Lys Asn Ala Thr Lys Gly Leu Thr Ser Asp
35 40 45
Glu Glu Glu Lys Lys Lys Glu Asp Gln
50 55

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<213> *Bacillus subtilis*

<400> 4
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Ala Ile Ile Ile Phe Gly Pro Ser Lys Leu Pro Glu Ile Gly Arg Ala
20 25 30
Ala Lys Arg Thr Leu Leu Glu Phe Lys Ser Ala Thr Lys Ser Leu Val
35 40 45
Ser Gly Asp Glu Lys Glu Glu Lys Ser Ala Glu Leu Thr Ala Val Lys
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Gln Asp Lys Asn Ala Gly
65 70

<210> 5
<211> 62
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<213> *Bacillus subtilis*

<400> 5
Met Glu Leu Ser Phe Thr Lys Ile Leu Val Ile Leu Phe Val Gly Phe
1 5 10 15
Leu Val Phe Gly Pro Asp Lys Leu Pro Ala Leu Gly Arg Ala Ala Gly
20 25 30
Lys Ala Leu Ser Glu Phe Lys Gln Ala Thr Ser Gly Leu Thr Gln Asp
35 40 45
Ile Arg Lys Asn Asp Ser Glu Asn Lys Glu Asp Lys Gln Met
50 55 60

<210> 6
<211> 171
<212> PRT
<213> *Escherichia coli*

<400> 6
Met Phe Asp Ile Gly Phe Ser Glu Leu Leu Leu Val Phe Ile Ile Gly

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Leu	Val	Val	Leu	Gly	Pro	Gln	Arg	Leu	Pro	Val	Ala	Val	Lys	Thr	Val	
			20					25					30			
Ala	Gly	Trp	Ile	Arg	Ala	Leu	Arg	Ser	Leu	Ala	Thr	Thr	Val	Gln	Asn	
		35					40					45				
Glu	Leu	Thr	Gln	Glu	Leu	Lys	Leu	Gln	Glu	Phe	Gln	Asp	Ser	Leu	Lys	
	50					55				60						
Lys	Val	Glu	Lys	Ala	Ser	Leu	Thr	Asn	Leu	Thr	Pro	Glu	Leu	Lys	Ala	
65					70				75						80	
Ser	Met	Asp	Glu	Leu	Arg	Gln	Ala	Ala	Glu	Ser	Met	Lys	Arg	Ser	Tyr	
			85					90						95		
Val	Ala	Asn	Asp	Pro	Glu	Lys	Ala	Ser	Asp	Glu	Ala	His	Thr	Ile	His	
		100						105					110			
Asn	Pro	Val	Lys	Asp	Asn	Glu	Ala	Ala	His	Glu	Gly	Val	Thr	Pro		
		115				120					125					
Ala	Ala	Ala	Gln	Thr	Gln	Ala	Ser	Ser	Pro	Glu	Gln	Lys	Pro	Glu	Thr	
	130					135					140					
Thr	Pro	Glu	Pro	Val	Val	Lys	Pro	Ala	Ala	Asp	Ala	Glu	Pro	Lys	Thr	
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<210> 7

<211> 258

<212> PRT

<213> Escherichia coli

<400> 7

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Arg	Lys	Arg	Leu	Leu	Asn	Cys	Ile	Ile	Ala	Val	Ile	Val	Ile	Phe	Leu	
		20					25					30				
Cys	Leu	Val	Tyr	Phe	Ala	Asn	Asp	Ile	Tyr	His	Leu	Val	Ser	Ala	Pro	
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Leu	Ile	Lys	Gln	Leu	Pro	Gln	Gly	Ser	Thr	Met	Ile	Ala	Thr	Asp	Val	
	50					55				60						
Ala	Ser	Pro	Phe	Phe	Thr	Pro	Ile	Lys	Leu	Thr	Phe	Met	Val	Ser	Leu	
65				70				75							80	
Ile	Leu	Ser	Ala	Pro	Val	Ile	Leu	Tyr	Gln	Val	Trp	Ala	Phe	Ile	Ala	
			85					90					95			
Pro	Ala	Leu	Tyr	Lys	His	Glu	Arg	Arg	Leu	Val	Val	Pro	Leu	Leu	Val	
		100					105						110			
Ser	Ser	Ser	Leu	Leu	Phe	Tyr	Ile	Gly	Met	Ala	Phe	Ala	Tyr	Phe	Val	
		115				120					125					
Val	Phe	Pro	Leu	Ala	Phe	Gly	Phe	Leu	Ala	Asn	Thr	Ala	Pro	Glu	Gly	
	130					135					140					
Val	Gln	Val	Ser	Thr	Asp	Ile	Ala	Ser	Tyr	Leu	Ser	Phe	Val	Met	Ala	
145					150				155						160	
Leu	Phe	Met	Ala	Phe	Gly	Val	Ser	Phe	Glu	Val	Pro	Val	Ala	Ile	Val	
			165					170						175		
Leu	Leu	Cys	Trp	Met	Gly	Ile	Thr	Ser	Pro	Glu	Asp	Leu	Arg	Lys	Lys	
		180						185					190			
Arg	Pro	Tyr	Val	Leu	Val	Gly	Ala	Phe	Val	Val	Gly	Met	Leu	Leu	Thr	
		195				200						205				
Pro	Pro	Asp	Val	Phe	Ser	Gln	Thr	Leu	Leu	Ala	Ile	Pro	Met	Tyr	Cys	
	210					215					220					
Leu	Phe	Glu	Ile	Gly	Val	Phe	Phe	Ser	Arg	Phe	Tyr	Val	Gly	Lys	Gly	

50		55		60	
Met Met Leu Ser Gly Ile Cys Ala Ile Ala Ala Ser Ile Pro Val Ala					
65		70		75	80
Ala Tyr Gln Leu Trp Arg Phe Val Ala Pro Ala Leu Thr Lys Thr Glu					
	85		90		95
Arg Lys Val Thr Ile Met Tyr Ile Met Tyr Ile Pro Gly Leu Phe Ala					
	100		105		110
Leu Phe Leu Ala Gly Ile Ser Phe Gly Tyr Phe Val Leu Phe Pro Ile					
	115		120		125
Val Leu Ser Phe Leu Thr His Leu Ser Ser Gly His Phe Glu Thr Met					
	130		135		140
Phe Thr Ala Asp Arg Tyr Phe Arg Phe Met Val Asn Leu Ser Leu Pro					
145		150		155	160
Phe Gly Phe Leu Phe Glu Met Pro Leu Val Val Met Phe Leu Thr Arg					
	165		170		175
Leu Gly Ile Leu Asn Pro Tyr Arg Leu Ala Lys Ala Arg Lys Leu Ser					
	180		185		190
Tyr Phe Leu Leu Ile Val Val Ser Ile Leu Ile Thr Pro Pro Asp Phe					
	195		200		205
Ile Ser Asp Phe Leu Val Met Ile Pro Leu Leu Val Leu Phe Glu Val					
	210		215		220
Ser Val Thr Leu Ser Ala Phe Val Tyr Lys Lys Arg Met Arg Glu Glu					
225		230		235	240
Thr Ala Ala Ala Ala					
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 <213> Bacillus alcalophilus

<400> 10	
Met Gly Gly Leu Ser Val Gly Ser Val Val Leu Ile Ala Leu Val Ala	
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Leu Leu Ile Phe Gly Pro Lys Lys Leu Pro Glu Leu Gly Lys Ala Ala	
	20 25 30
Gly Ser Thr Leu Arg Glu Phe Lys Asn Ala Thr Lys Gly Leu Ala Asp	
	35 40 45
Asp Asp Asp Asp Thr Lys Ser Thr Asn Val Gln Lys Glu Lys Ala	
	50 55 60

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 <213> Bacillus alcalophilus

<400> 11	
Met Thr Met Met Thr Pro Asn Gln Gln Thr Ser Lys Lys Lys Lys Arg	
1	5 10 15
Lys Gly Arg Lys Gly Arg Val Pro Met Gln Asp Met Ser Ile Met Asp	
	20 25 30
His Ala Glu Glu Leu Arg Arg Arg Ile Phe Val Val Leu Ala Phe Phe	
	35 40 45
Ile Val Ala Leu Ile Gly Gly Phe Phe Leu Ala Val Pro Val Ile Thr	
	50 55 60
Phe Leu Gln Asn Ser Pro Gln Ala Ala Asp Met Pro Phe Asn Ala Phe	
65	70 75 80

Arg	Leu	Thr	Asp	Pro	Leu	Arg	Val	Tyr	Met	Asn	Phe	Ala	Val	Ile	Thr
				85					90					95	
Ala	Leu	Val	Leu	Ile	Ile	Pro	Val	Ile	Leu	Tyr	Gln	Leu	Trp	Ala	Phe
			100					105					110		
Val	Ser	Pro	Gly	Leu	Lys	Glu	Asn	Glu	Gln	Lys	Ala	Thr	Leu	Ala	Tyr
	115					120						125			
Ile	Pro	Ile	Ala	Phe	Leu	Leu	Phe	Leu	Ala	Gly	Ile	Ala	Phe	Ser	Tyr
	130				135						140				
Phe	Ile	Leu	Leu	Pro	Phe	Val	Ile	Ser	Phe	Met	Gly	Gln	Met	Ala	Asp
145				150					155					160	
Arg	Leu	Glu	Ile	Asn	Glu	Met	Tyr	Gly	Ile	Asn	Glu	Tyr	Phe	Ser	Phe
			165					170					175		
Leu	Phe	Gln	Leu	Thr	Ile	Pro	Phe	Gly	Leu	Leu	Phe	Gln	Leu	Pro	Val
		180						185					190		
Val	Val	Met	Phe	Leu	Thr	Arg	Leu	Gly	Val	Val	Thr	Pro	Thr	Phe	Leu
		195				200						205			
Arg	Lys	Ile	Arg	Lys	Tyr	Ala	Tyr	Phe	Ala	Leu	Leu	Val	Ile	Ala	Gly
	210				215					220					
Ile	Ile	Thr	Pro	Pro	Glu	Leu	Thr	Ser	His	Leu	Phe	Val	Thr	Val	Pro
225					230				235					240	
Met	Leu	Ile	Leu	Tyr	Glu	Ile	Ser	Ile	Thr	Ile	Ser	Ala	Ile	Thr	Tyr
			245					250					255		
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<220>
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<400> 12
 cccaagctta tgaaagggag ggcttttttg aatgg

35

<210> 13
 <211> 26
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<220>
 <223> primer

<400> 13
 gcggatccaa agctgagcac gatcgg

26

<210> 14
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<400> 14
 cccaagctta aaaagaaaga agatcagtaa gttaggatg

39

<210> 15
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<223> primer

<400> 15
gcggatccaa gtcctgagaa atccg

25

<210> 16
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<220>
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<400> 16
ggaattcgtg ggacggctac c

21

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<400> 17
cgggatccat catgggaagc g

21

<210> 18
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<220>
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<400> 18
ggggtaccgg aaaacgcttg atcagg

26

<210> 19
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<220>
<223> primer

<400> 19
cgggatacctt tgggcgatag cc

22

<210> 20

<211> 42
 <212> DNA
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 <400> 20
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 <210> 21
 <211> 27
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 <400> 21
 cgatcctgca ggacctcatc ggattgc 27

 <210> 22
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 <220>
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 <400> 22
 gtaggatccg cgcctaactt ctcaagc 27

 <210> 23
 <211> 25
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 <220>
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 <400> 23
 atagaattca aaaaggaaga gtatg 25

 <210> 24
 <211> 24
 <212> DNA
 <213> Artificial Sequence

 <220>
 <223> primer

 <400> 24
 ctggggatcc aaaaacagga aggc 24

 <210> 25
 <211> 35
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<213> Artificial Sequence

<220>

<223> primer

<400> 25
gagaaggctg acgcagcatt tacttcaaag gcccc 35

<210> 26
<211> 26
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<220>

<223> primer

<400> 26
accgggtcga ccgtcgtttt acaacg 26

<210> 27
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<223> primer

<400> 27
gggaattcat ggcctgcccg gtt 23

<210> 28
<211> 24
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<220>

<223> primer

<400> 28
caaggatccc gaattaagga gtgg 24

<210> 29
<211> 27
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<220>

<223> primer

<400> 29
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<210> 30
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<220>
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 subtilis

<400> 30
 Arg Arg Ile Leu Leu
 1 5

<210> 31
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<220>
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 subtilis

<400> 31
 Arg Arg Ser Phe Glu
 1 5

<210> 32
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<220>
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 subtilis

<400> 32
 Arg Arg Thr Leu Met
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<210> 33
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<220>
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<400> 33
 Arg Arg Ile Ile Ala
 1 5

<210> 34
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<220>
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<400> 34

Arg Arg Leu Val Tyr
1 5

<210> 35
<211> 5
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subtilis

<400> 35
Arg Arg Arg Lys Leu
1 5

<210> 36
<211> 5
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<220>
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subtilis

<400> 36
Arg Arg Lys Phe Ile
1 5

<210> 37
<211> 5
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<220>
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subtilis

<400> 37
Arg Arg Gln Phe Leu
1 5

<210> 38
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
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subtilis

<400> 38
Arg Arg Leu Ile Ile
1 5

<210> 39
<211> 5

<212> PRT
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 <220>
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 <400> 39
 Arg Arg Asn Phe Lys
 1 5

 <210> 40
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 <220>
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 1 5

 <210> 41
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 <220>
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 <400> 41
 Arg Arg Ala Phe Leu
 1 5

 <210> 42
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 <220>
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 subtilis

 <400> 42
 Arg Arg Met Lys Ile
 1 5

 <210> 43
 <211> 5
 <212> PRT
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 <220>
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subtilis

<400> 43

Arg Arg Ser Cys Leu
1 5

<210> 44

<211> 5

<212> PRT

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<220>

<223> predicted twin-arginine (RR-)signal peptides of B.
subtilis

<400> 44

Arg Arg Thr His Val
1 5

<210> 45

<211> 5

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<223> predicted twin-arginine (RR-)signal peptides of B.
subtilis

<400> 45

Arg Arg Val Ala Ile
1 5

<210> 46

<211> 5

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subtilis

<400> 46

Arg Arg Gln Phe Leu
1 5

<210> 47

<211> 5

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subtilis

<400> 47

Arg Arg Phe Leu Leu
1 5

<210> 48
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 <400> 48
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 1 5

 <210> 49
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 <400> 49
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 1 5

 <210> 50
 <211> 5
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 1 5

 <210> 51
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 <220>
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 subtilis

 <400> 51
 Arg Arg Asp Ile Leu
 1 5

 <210> 52
 <211> 42
 <212> PRT
 <213> Artificial Sequence

<220>

<223> predicted twin-arginine signal peptides of B.
subtilis

<400> 52

Ser	Pro	Ala	Gln	Arg	Arg	Ile	Leu	Leu	Tyr	Ile	Leu	Ser	Phe	Ile	Phe
1				5					10					15	
Val	Ile	Gly	Ala	Val	Val	Tyr	Phe	Val	Lys	Ser	Asp	Tyr	Leu	Phe	Thr
		20						25					30		
Leu	Ile	Phe	Ile	Ala	Ile	Ala	Ile	Leu	Phe						
		35					40								

<210> 53

<211> 30

<212> PRT

<213> Artificial Sequence

<220>

<223> predicted twin-arginine signal peptides of B.
subtilis

<400> 53

Met	Val	Ser	Ile	Arg	Arg	Ser	Phe	Glu	Ala	Tyr	Val	Asp	Asp	Met	Asn
1				5					10					15	
Ile	Ile	Thr	Val	Leu	Ile	Pro	Ala	Glu	Gln	Lys	Glu	Ile	Met		
			20					25					30		

<210> 54

<211> 32

<212> PRT

<213> Artificial Sequence

<220>

<223> predicted twin-arginine signal peptides of B.
subtilis

<400> 54

Met	Ala	Ala	Tyr	Ile	Ile	Arg	Arg	Thr	Leu	Met	Ser	Ile	Pro	Ile	Leu
1				5					10					15	
Leu	Gly	Ile	Thr	Ile	Leu	Ser	Phe	Val	Ile	Met	Lys	Ala	Ala	Pro	Gly
			20					25					30		

<210> 55

<211> 34

<212> PRT

<213> Artificial Sequence

<220>

<223> predicted twin-arginine signal peptides of B.
subtilis

<400> 55

Met	Lys	Phe	Val	Lys	Arg	Arg	Ile	Ile	Ala	Leu	Val	Thr	Ile	Leu	Met
1				5					10					15	
Leu	Ser	Val	Thr	Ser	Leu	Phe	Ala	Leu	Gln	Pro	Ser	Ala	Lys	Ala	Ala
			20					25					30		

Glu His

<210> 56

<211> 32

<212> PRT

<213> Artificial Sequence

<220>

<223> predicted twin-arginine signal peptides of B.
subtilis

<400> 56

Met	Leu	Lys	Tyr	Ile	Gly	Arg	Arg	Leu	Val	Tyr	Met	Ile	Ile	Thr	Leu
1				5				10						15	
Phe	Val	Ile	Val	Thr	Val	Thr	Phe	Phe	Leu	Met	Gln	Ala	Ala	Pro	Gly
			20				25						30		

<210> 57

<211> 42

<212> PRT

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<220>

<223> predicted twin-arginine signal peptides of B.
subtilis

<400> 57

Met	Thr	Ser	Pro	Thr	Arg	Arg	Arg	Thr	Ala	Lys	Arg	Arg	Arg	Arg	Lys
1				5				10						15	
Leu	Asn	Lys	Arg	Gly	Lys	Leu	Leu	Phe	Gly	Leu	Leu	Ala	Val	Met	Val
			20				25						30		
Cys	Ile	Thr	Ile	Trp	Asn	Ala	Leu	His	Arg						
			35				40								

<210> 58

<211> 54

<212> PRT

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<220>

<223> predicted twin-arginine signal peptides of B.
subtilis

<400> 58

Met	Ala	Tyr	Asp	Ser	Arg	Phe	Asp	Glu	Trp	Val	Gln	Lys	Leu	Lys	Glu
1				5				10						15	
Glu	Ser	Phe	Gln	Asn	Asn	Thr	Phe	Asp	Arg	Arg	Lys	Phe	Ile	Gln	Gly
			20				25						30		
Ala	Gly	Lys	Ile	Ala	Gly	Leu	Ser	Gly	Leu	Thr	Ile	Ala	Gln	Ser	
			35			40						45			
Val	Gly	Ala	Phe	Glu	Val										

<210> 59

<211> 36

<212> PRT

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<220>

<223> predicted twin-arginine signal peptides of B.
subtilis

<400> 59

Met	Gly	Gly	Lys	His	Asp	Ile	Ser	Arg	Arg	Gln	Phe	Leu	Asn	Tyr	Thr
1				5					10					15	
Leu	Thr	Gly	Val	Gly	Gly	Phe	Met	Ala	Ala	Ser	Met	Leu	Met	Pro	Met
			20					25					30		
Val	Arg	Phe	Ala												
			35												

<210> 60

<211> 26

<212> PRT

<213> Artificial Sequence

<220>

<223> predicted twin-arginine signal peptides of B.
subtilis

<400> 60

Met	Leu	Leu	Lys	Arg	Arg	Ile	Gly	Leu	Leu	Leu	Ser	Met	Val	Gly	Val
1				5					10					15	
Phe	Met	Leu	Leu	Ala	Gly	Cys	Ser	Ser	Val						
			20					25							

<210> 61

<211> 39

<212> PRT

<213> Artificial Sequence

<220>

<223> predicted twin-arginine signal peptides of B.
subtilis

<400> 61

Met	Lys	Lys	Thr	Leu	Thr	Thr	Ile	Arg	Arg	Ser	Ser	Ile	Ala	Arg	Arg
1				5					10					15	
Leu	Ile	Ile	Ser	Phe	Leu	Leu	Ile	Leu	Ile	Val	Pro	Ile	Thr	Ala	Leu
			20					25					30		
Ser	Val	Ser	Ala	Tyr	Gln	Ser									
			35												

<210> 62

<211> 35

<212> PRT

<213> Artificial Sequence

<220>

<223> predicted twin-arginine signal peptides of B.
subtilis

<400> 62

Met	Lys	Lys	Arg	Lys	Arg	Arg	Asn	Phe	Lys	Arg	Phe	Ile	Ala	Ala	Phe
1				5					10					15	

Leu Val Leu Ala Leu Met Ile Ser Leu Val Pro Ala Asp Val Leu Ala
 20 25 30
 Lys Ser Thr
 35

<210> 63
 <211> 33
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> predicted twin-arginine signal peptides of B.
 subtilis

<400> 63
 Lys Arg Arg Lys Phe Ser Ser Val Val Ala Ala Val Leu Ile Phe Ala
 1 5 10 15
 Leu Ile Phe Ser Leu Phe Ser Pro Gly Thr Lys Ala Ala Ala Ala Gly
 20 25 30
 Ala

<210> 64
 <211> 35
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> predicted twin-arginine signal peptides of B.
 subtilis

<400> 64
 Met Glu Met Phe Asp Leu Glu Phe Met Arg Arg Ala Phe Leu Ala Gly
 1 5 10 15
 Gly Met Ile Ala Val Met Ala Pro Ile Leu Gly Val Tyr Leu Val Leu
 20 25 30
 Arg Arg Gln
 35

<210> 65
 <211> 26
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> predicted twin-arginine signal peptides of B.
 subtilis

<400> 65
 Met Lys Lys Arg Arg Lys Ile Cys Tyr Cys Asn Thr Ala Leu Leu Leu
 1 5 10 15
 Met Ile Leu Leu Ala Gly Cys Thr Asp Ser
 20 25

<210> 66
 <211> 20
 <212> PRT
 <213> Artificial Sequence

<220>

<223> predicted twin-arginine signal peptides of B.
subtilis

<400> 66

Met	Arg	Arg	Ile	Leu	Ser	Ile	Leu	Val	Phe	Ala	Ile	Met	Leu	Ala	Gly
1				5					10					15	
Cys	Ser	Ser	Asn												
			20												

<210> 67

<211> 43

<212> PRT

<213> Artificial Sequence

<220>

<223> predicted twin-arginine signal peptides of B.
subtilis

<400> 67

Met	Ser	Ala	Gly	Lys	Ser	Tyr	Arg	Lys	Lys	Met	Lys	Gln	Arg	Arg	Met
1				5					10					15	
Asn	Met	Lys	Ile	Ser	Lys	Tyr	Ala	Leu	Gly	Ile	Leu	Met	Leu	Ser	Leu
			20					25					30		
Val	Phe	Val	Leu	Ser	Ala	Cys	Gly	Asn	Asn	Asn					
		35					40								

<210> 68

<211> 42

<212> PRT

<213> Artificial Sequence

<220>

<223> predicted twin-arginine signal peptides of B.
subtilis

<400> 68

Lys	Lys	Arg	Val	Ala	Gly	Trp	Tyr	Arg	Arg	Met	Lys	Ile	Lys	Asp	Lys
1				5					10					15	
Leu	Phe	Val	Phe	Leu	Ser	Leu	Ile	Met	Ala	Val	Ser	Phe	Leu	Phe	Val
			20					25					30		
Tyr	Ser	Gly	Val	Gln	Tyr	Ala	Phe	His	Val						
		35					40								

<210> 69

<211> 38

<212> PRT

<213> Artificial Sequence

<220>

<223> predicted twin-arginine signal peptides of B.
subtilis

<400> 69

Met	Arg	Arg	Ser	Cys	Leu	Met	Ile	Arg	Arg	Arg	Lys	Arg	Met	Phe	Thr
1				5					10					15	

Ala Val Thr Leu Leu Val Leu Leu Val Met Gly Thr Ser Val Cys Pro
 20 25 30
 Val Lys Ala Glu Gly Ala
 35

<210> 70
 <211> 38
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> predicted twin-arginine signal peptides of B.
 subtilis

<400> 70
 Met Arg Ile Gln Lys Arg Arg Thr His Val Glu Asn Ile Leu Arg Ile
 1 5 10 15
 Leu Leu Pro Pro Ile Met Ile Leu Ser Leu Ile Leu Pro Thr Pro Pro
 20 25 30
 Ile His Ala Glu Glu Ser
 35

<210> 71
 <211> 32
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> predicted twin-arginine signal peptides of B.
 subtilis

<400> 71
 Met Leu Arg Asp Leu Gly Arg Arg Val Val Ala Ile Ala Ala Ile Leu
 1 5 10 15
 Ser Gly Ile Ile Leu Gly Gly Met Ser Ile Ser Leu Ala Asn Met Pro
 20 25 30

<210> 72
 <211> 34
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> predicted twin-arginine signal peptides of B.
 subtilis

<400> 72
 Met Lys Lys Met Ser Arg Arg Gln Phe Leu Lys Gly Met Phe Gly Ala
 1 5 10 15
 Leu Ala Ala Gly Ala Leu Thr Ala Gly Gly Gly Tyr Gly Tyr Ala Arg
 20 25 30
 Tyr Leu

<210> 73
 <211> 28
 <212> PRT
 <213> Artificial Sequence

<220>

<223> predicted twin-arginine signal peptides of B.
subtilis

<400> 73

Met	Arg	Arg	Phe	Leu	Leu	Asn	Val	Ile	Leu	Val	Leu	Ala	Ile	Val	Leu
1				5					10					15	
Phe	Leu	Arg	Tyr	Val	His	Tyr	Ser	Leu	Glu	Pro	Glu				
			20					25							

<210> 74

<211> 29

<212> PRT

<213> Artificial Sequence

<220>

<223> predicted twin-arginine signal peptides of B.
subtilis

<400> 74

Met	Phe	Glu	Ser	Glu	Ala	Glu	Leu	Arg	Arg	Ile	Arg	Ile	Ala	Leu	Val
1				5					10					15	
Trp	Ile	Ala	Val	Phe	Leu	Leu	Phe	Gly	Ala	Cys	Gly	Asn			
			20					25							

<210> 75

<211> 37

<212> PRT

<213> Artificial Sequence

<220>

<223> predicted twin-arginine signal peptides of B.
subtilis

<400> 75

Met	Gln	Lys	Tyr	Arg	Arg	Arg	Asn	Thr	Val	Ala	Phe	Thr	Val	Leu	Ala
1				5					10					15	
Tyr	Phe	Thr	Phe	Phe	Ala	Gly	Val	Phe	Leu	Phe	Ser	Ile	Gly	Leu	Tyr
			20					25					30		
Asn	Ala	Asp	Asn	Leu											
			35												

<210> 76

<211> 34

<212> PRT

<213> Artificial Sequence

<220>

<223> predicted twin-arginine signal peptides of B.
subtilis

<400> 76

Met	Met	Leu	Asn	Met	Ile	Arg	Arg	Leu	Leu	Met	Thr	Cys	Leu	Phe	Leu
1				5					10					15	
Leu	Ala	Phe	Gly	Thr	Thr	Phe	Leu	Ser	Val	Ser	Gly	Ile	Glu	Ala	Lys
			20					25					30		
Asp	Leu														

<210> 77
 <211> 44
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> predicted twin-arginine signal peptides of B.
 subtilis

<400> 77
 Met Ala Glu Arg Val Arg Val Arg Val Arg Lys Lys Lys Lys Ser Lys
 1 5 10 15
 Arg Arg Lys Ile Leu Lys Arg Ile Met Leu Leu Phe Ala Leu Ala Leu
 20 25 30
 Leu Val Val Val Gly Leu Gly Gly Tyr Lys Leu Tyr
 35 40

<210> 78
 <211> 47
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> predicted twin-arginine signal peptides of B.
 subtilis

<400> 78
 Met Ser Asp Glu Gln Lys Lys Pro Glu Gln Ile His Arg Arg Asp Ile
 1 5 10 15
 Leu Lys Trp Gly Ala Met Ala Gly Ala Val Ala Ile Gly Ala Ser
 20 25 30
 Gly Leu Gly Gly Leu Ala Pro Leu Val Gln Thr Ala Ala Lys Pro
 35 40 45

<210> 79
 <211> 54
 <212> PRT
 <213> Bacillus subtilis

<400> 79
 Met Ala Tyr Asp Ser Arg Phe Asp Glu Trp Val Gln Lys Leu Lys Glu
 1 5 10 15
 Glu Ser Phe Gln Asn Asn Arg Phe Asp Arg Arg Lys Phe Ile Gln Gly
 20 25 30
 Ala Gly Lys Ile Ala Gly Leu Ser Leu Gly Leu Thr Ile Ala Gln Ser
 35 40 45
 Val Gly Ala Phe Glu Val
 50

<210> 80
 <211> 65
 <212> PRT
 <213> Streptomyces coelicolor

<400> 80
 Met Thr Pro Ala Asn His Gln Ala Pro Thr Ser Ala Pro Ser Pro Ala
 1 5 10 15

Pro Ser Gln Ser Ser His Ala Pro Glu Leu Arg Ala Ala Ala Arg Ser
 20 25 30
 Leu Gly Arg Arg Arg Phe Leu Thr Val Thr Gly Ala Ala Ala Ala Leu
 35 40 45
 Ala Phe Ala Val Asn Leu Pro Ala Ala Gly Thr Ala Ser Ala Ala Glu
 50 55 60
 Leu
 65

<210> 81
 <211> 60
 <212> PRT
 <213> Streptomyces coelicolor

<400> 81
 Met Ala Pro Thr Gly Arg Pro Ser Ala Leu Ala Glu His Ala Phe Ser
 1 5 10 15
 Pro His Asp Ala Val Leu Gly Ala Ala Ala Arg His Leu Gly Arg Arg
 20 25 30
 Arg Phe Leu Thr Val Thr Ala Ala Ala Ala Leu Ala Phe Ser Thr
 35 40 45
 Asn Leu Pro Ala Arg Gly Ala Val Ala Ala Pro Glu
 50 55 60

<210> 82
 <211> 47
 <212> PRT
 <213> Streptomyces coelicolor

<400> 82
 Met Thr Ser Arg His Arg Ala Ser Glu Asn Ser Arg Thr Pro Ser Arg
 1 5 10 15
 Arg Thr Val Val Lys Ala Ala Ala Ala Gly Ala Val Leu Ala Ala Pro
 20 25 30
 Leu Ala Ala Ala Leu Pro Ala Gly Ala Ala Asp Ala Ala Pro Ala
 35 40 45

<210> 83
 <211> 53
 <212> PRT
 <213> Streptomyces tendae

<400> 83
 Met Thr Pro Ala Ala Arg Pro Ser Gln His Ala Pro Glu Leu Arg Ala
 1 5 10 15
 Ala Ala Arg His Leu Gly Arg Arg Arg Phe Leu Thr Val Thr Gly Ala
 20 25 30
 Ala Ala Ala Leu Ala Phe Ala Val Asn Leu Pro Ala Ala Gly Thr Ala
 35 40 45
 Ala Ala Ala Glu Leu
 50